A CYTOTAXONOMIC CONTRIBUTION TO THE WESTERN NORTH AMERICAN ROSACEOUS FLORA

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Abstract

New chromosome counts are reported for *Cercocarpus montanus* Raf. var. *montanus* and *C. ledifolius* Nutt. (2 varieties), $x = n = 9$; *Chamaebatia australis* (Brandg.) Abrams and *C. foliolosa* Benth., $x = n = 9$; *Chamaebatiaria millifolium* (Torr.) Maxim., $x = n = 9$; *Coleogyne ramosissima* Torr., $x = n = 8$; *Holodiscus dumosus* (Nutt.) Heller, $2x = n = 18$; *Kelseya uniflora* (Wats.) Rydb., $x = n = 18$; *Peraphyllum ramosissimum* Nutt., $x = n = 17$; and *Petrophytum caespitosum* (Nutt.) Rydb., $x = n = 18$. The counts are related to rosaceous subfamilial taxonomy. All taxa are relatively narrowly (geographically or ecotypically) distributed endemics. *Cercocarpus* and *Holodiscus* are the most wide ranging taxa.

Rosaceae, consisting of four subfamilies (Rosoideae, Prunoideae, Spiraeoideae, and Pomoideae), is pandemic but most common in the northern temperate region—especially western North America and eastern Asia (Raven and Axelrod 1974, Robertson 1974, Goldblatt 1976, Jones and Luchsinger 1979). In this paper we report chromosome counts for 10 species in 8 genera for three of the subfamilies. These counts are first reports for three varieties, nine species, and seven genera. Base chromosome numbers of the four subfamilies of Rosaceae are summarized in Table 1.

Materials and Methods

Chromosome counts were made from root tips of germinated seedlings or from plants brought from the field to a mist bench and stimulated to produce additional roots; or from pollen mother cells (PMCs). Fixation was in 5% acetic acid or 1 N HCl. Roots were hydrolyzed in 1 N HCl for four hours at room temperature. Staining was by iron acetocarmine, air-evaporated on the slide to increase its concentration. Preparations were mounted in Hoyer's medium and examined microscopically under light field (meiosis) or phase contrast (mitosis) (Sanderson et al., in review). Counts were made from several plants (2–5) for each sampled population. Voucher herbarium specimens of representative samples were placed in the herbarium at the Intermountain Station's Shrub Sciences Laboratory (SSLP).

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TABLE 1. SUBFAMILIES OF ROSACEAE WITH CHARACTERISTIC CHROMOSOME NUMBERS AND GENERIC EXAMPLES. References: Ornduff (1967), Federov (1969), Moore (1973, 1974, 1977), Robertson (1974), Goldblatt (1976, 1981), McArthur et al. (1983), Baker et al. (1984), and Table 2. *New generic counts, Table 2.

Subfamily	Common x's	Other x's	Representative genera (*x*)
Rosoideae	7, 9	8, 14	*Fragaria, Geum, Potentilla, Rosa, Rubus, Sanguisorba* (7); *Alchemilla, Coleogyne** (8); *Adenostoma, Cercocarpus, Chamaebatia**, *Cowania, Dryas, Purshia* (9); *Fallugia* (14).
Prunoideae	8	—	*Exochorda, Oemleria, Prunus* (8).
Spiraeoideae	9	7	*Physocarpus, Spiraea, Aruncus* (7, 9); *Chamaebatiaria**, *Holodiscus**, *Kelseya**, *Petrophytum**, *Luetkea* (9).
Pomoideae	17	14, 15	*Quillaja* (14); *Vauquelinia* (15); *Amelanchier, Cotoneaster, Crataegus, Malus, Peraphyllum**, *Pyracantha, Pyrus, Sorbus* (17).

RESULTS AND DISCUSSION

The counts reported in Table 2 reveal no major surprises. Each corresponds to a base number consistent with previous records in its subfamily, unlike the new base numbers recently reported for *Fallugia* ($x = 14$) (Rosoideae) (McArthur et al. 1983, Baker et al., 1984) and for *Quillaja* ($x = 14$) and *Vauquelinia* ($x = 15$) (Pomoideae) (Goldblatt 1976).

Each generic count is new except for *Cercocarpus,* which had been reported $x = n = 9$ for one population of *C. betuloides* Nutt. (Morley 1949)—best referred to as *C. montanus* Raf. var. *glaber* (Wats.) F. L. Martin (Martin 1950). We report original counts for the typical variety of *C. montanus* Raf. and two varieties of *C. ledifolius* Nutt. Both species of *Chamaebatia* (Rosoideae) and its namesake genus *Chamaebatiaria* (Spiraeoideae) are $x = n = 9$.

Perhaps our most interesting new count is that of *Coleogyne ramosissima* Torr. (Rosoideae), a relictual endemic from the Mohave-Cold Desert ecotone (Bowns and West 1976). This species had $x = n = 8$ chromosomes. This is only the second unequivocal $x = 8$ count for Rosoideae (Table 2; Robertson 1974). *Coleogyne* is quite different from most other Rosoideae (and Rosaceae) in having 4- rather than 5-merous flowers. *Alchemilla,* the other $x = 8$ Rosoideae genus, is also 4-merous.

Holodiscus dumosus (Nutt.) Heller, $2x = n = 18$, was the lone new count we uncovered above the diploid basic number. Higher base numbers are not unexpected among the Rosaceae, where polyploidy is quite common in some groups (references cited for Table 1).

TABLE 2. CHROMOSOME COUNTS OF ROSACEOUS SHRUBS. *First report for taxon.

Taxa	Location, collection number	Chromosome count
Cercocarpus ledifolius Nutt. var. *intercedens* C. K. Schneider	Big Horn Mts., near Dayton, Sheridan Co., WY, 1230 m, *S. B. Monsen s.n.*, Jun 1982.	$2n = 18$*
Cercocarpus ledifolius Nutt. var. *ledifolius*	Near Adin, Lassen Co., CA, 1370 m, *J. A. Young s.n.*	$2n = 18$*
	Near Soda Springs, Caribou Co., ID, 2120 m, *J. N. Davis AB 849.*	$2n = 18$
	Near Verdi, Washoe Co., NV, 1520 m, *J. A. Young s.n.*	$2n = 18$
	Mineral Mountain Pass, Beaver Co., UT, 2050 m, *J. N. Davis S-12.*	$2n = 18$
	Near Cedar City, Iron Co., UT, 2100 m, *W. R. Stewart s.n.* (U 23).	$2n = 18$
	Weber Canyon, Morgan Co., UT, 2000 m, *J. N. Davis AB 681.*	$2n = 18$
Cercocarpus montanus Raf. var. *montanus*	Salt Creek Canyon, Juab Co., UT, 1800 m, *M. Black s.n.*, 6 Jun 1961 (U 8).	$2n = 18$*
Chamaebatia australis (Brandg.) Abrams	Tecate Peak, San Diego Co., CA, 760 m, *M. Kottman s.n.*, 20 Dec 1982.	$n = 9$*
Chamaebatia foliolosa Benth.	Near Auburn, Placer Co., CA, 500 m, *McArthur 1361.*	$2n = 18$*
Chamaebatiaria millifolium (Torr.) Maxim.	Marysvale Canyon, Sevier Co., UT, 1800 m, *McArthur and Sanderson 1339* (U 1).	$n = 9$*
	Ophir Canyon, Oquirrh Mtns., Tooele Co., UT, 2000 m, *McArthur 1370.*	$n = 9$
Coleogyne ramosissima	Tobin Wash, Washington Co., UT, 1250 m, *T. B. Moore s.n.*, 29 Jun 1978 (U 4).	$2n = 16$*
	Motoqua, Washington Co., UT, 1250 m, *J. E. Bowns s.n.*	$2n = 16$
Holodiscus dumosus (Nutt.) Heller	Chalk Cr., Pavant Range, Millard Co., UT, 1860 m, *S. Goodrich 16897.*	$n = 18$*
Kelseya uniflora (Wats.) Rydb.	Pass Canyon, Lost River Range, Custer Co., ID, 1840 m, *Sanderson 1367.*	$2n = 18$*
Peraphyllum ramosissimum Nutt.	Near Monticello, San Juan Co., UT, 2130 m, *W. R. Stewart s.n.*, 18 Aug 1965 (U 9).	$2n = 34$*

TABLE 2. CONTINUED.

Taxa	Location, collection number	Chromosome count
Petrophytum caespitosum (Nutt.) Rydb.	Rock Canyon, Wasatch Range, Utah Co., UT, 1700 m, *McArthur and Sanderson 1365.*	$n = 9$*
	Pass Canyon, Lost River Range, Custer Co., ID, 1840 m, *Sanderson 1366.*	$n = 9$
	Valley Mts., near Gunnison, Sanpete Co., UT, 1920 m, *S. Goodrich s.n.*	$n = 9$

Kelseya uniflora (Wats.) Rydb. and *Petrophytum caespitosum* (Nutt.) Rydb. (Spiraeoideae) are restricted western North American endemics; both have $x = n = 9$ chromosomes. *Peraphyllum ramosissimum* Nutt. (Pomoideae), in common with the mainstream members of its subfamily, has $x = n = 17$ chromosomes. We suggested earlier (McArthur et al. 1983) that the shrubby $x = 9$ Rosoideae (*Adenostoma, Cercocarpus, Chamaebatia, Cowania, Dryas, Purshia*) of western North America might be closely allied with the shrubby $x = 9$ Spiraeoideae (*Chamaebatiaria, Holodiscus, Kelseya, Luetkea, Petrophytum, Physocarpus, Spiraea*) of the same area. Both groups are characterized by high endemism and monotypicism and by sclerophyllous or microphyllous leaf habit. These six Rosoideae may have more in common with the seven Spiraeoideae than with mesic, $x = 7$ Rosoideae, such as *Fragaria, Potentilla, Rosa, Rubus,* and *Sanguisorba.* For example, *Chamaebatia* of Rosoideae and *Chamaebatiaria* of Spiraeoideae resemble one another closely in their unusual leaf form, although they differ in fruit type. However, one unifying factor for the $x = 9$ Rosoideae is presence of actinomycete root nodulation (Klemmedson 1979, Nelson 1983). Spiraeoideae are not nodulated. We also point out that *Physocarpus* and *Spiraea* have $x = 7$ members in Asia in addition to their more common $x = 9$ North American and Asian taxa (McArthur et al. 1983).

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